

APPLICATION FOR  
UNITED STATES LETTERS PATENT  
SPECIFICATION

TO WHOM IT MAY CONCERN:

Be it known that we, Bradley D. Nelson, a citizen of the United States, residing at 1071 145th Street, in the City of Pella, County of Mahaska and State of Iowa 50219; William A. Hood, a citizen of the United States, residing at 302 248th Avenue, in the City of Pella, County of Marion and State of Iowa 50219; and Ryan G. Walker, a citizen of the United States, residing at 1620 W. 7th Street South, in the City of Newton, County of Jasper and State of Iowa 50208, have invented a new and useful **BALER ROTOR REVERSER**, of which the following is a specification.

## **BALER ROTOR REVERSER**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

Not Applicable

### **STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT**

Not Applicable

## **BACKGROUND OF THE INVENTION**

### **Field of the Invention**

This invention relates to a baler and more particularly to one which has a rotor for assisting the chopping of the crop before it enters a baling chamber and which allows the rotor to be reversed when the baler becomes plugged.

### **Description of the Related Art**

In a chopper baler, there is a pickup reel which picks a windrow of crop up from the ground and transfers it to a rotor which forces the crop through knives which can be

selectively engaged to cut the crop. This rotor effectively transfers the crop from the pickup reel to a baling chamber where the crop is turned into a bale. In the preferred embodiment, this baler is one for making large round bales, but this invention is not limited to a round baler.

From time to time, such a large amount of crop is moved from the reel to the rotor area that the crop is unable to pass through the throat of the machine. The rotor will then abruptly stop turning. This is termed a "blockage". Traditionally, the blockage is removed by hand or by use of a lever to manually turn the machine backwards to remove the blockage. Sometimes a powered shaft is used to turn the baler backwards. To some extent this is similar to combines which use electric starter motors or planetary drives that allow reversal of blockages.

The prior art of removing blockages by hand or with a lever or even with a powered shaft is time consuming and difficult. Consequently, there is a need for a device to more easily facilitate removing the blockage from a baler.

### **BRIEF SUMMARY OF THE INVENTION**

The present invention relates to a reverser, which in a preferred embodiment has a hydraulic cylinder supported by a chopper baler frame. The opposite end of the hydraulic cylinder is attached to the reverser driver. When activated by hydraulics on a tractor, the hydraulics will extend the cylinder, causing the sprockets to be disengaged. Further extension of the cylinder will cause the reverser driver to engage the reverser sprocket and turn the rotor backwards slightly. After full extension, the cylinder will then be retracted. This process can be repeated a couple of times in order to remove the

blockage.

The reverser enables the operator to restore the baler to its working condition from the tractor seat. Being able to disengage the rotor from the rest of the machine enables the bale to be wrapped if a major blockage occurs. Also a controlled reversing motion is beneficial, so over-reversing does not occur.

An object of the present invention is to provide an apparatus for allowing an operator to free the blockage of crop in a chopper baler from the tractor seat.

Another object of the present invention is to have a reverser which also disengages the rotor from the rest of the baler, to allow the bale to be wrapped in the event of a severe blockage.

A still further object of the present invention is to provide a reverser which reverses the rotor in incremental steps, thereby reducing the risk of damage to the machine.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

#### **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

FIG. 1 is a side elevational view of a chopper baler incorporating the preferred embodiment of the present invention thereto;

FIG. 2 is a cross sectional simplified view showing a bale being formed in a bale chamber, a pickup rotating to pull a windrow of crop to a rotor which rotates to move the crop to the baling chamber;

FIG. 3 is a view like FIG. 2, but showing the rotor reversing to pull crop from

the throat of a baler which is plugged;

FIG. 4 is an enlarged perspective view of a preferred embodiment of the present invention;

FIG. 5 is a cross sectional view showing the present invention in a normal operating position where a bale is being formed;

FIG. 5A is a top view of the present invention shown while a bale is being formed and is powered by the primary power to the baler;

FIG. 6 is a view like FIG. 5 but showing a spreader moved by a hydraulic cylinder to disengage the drive sprocket of the reverser from the primary driven sprocket so that a bale can be formed on the one hand and on the other hand set up a condition where the rotor can be reversed;

FIG. 6A is a top view of the present invention as described above in FIG. 6;

FIG. 7 shows a view showing the present device in a reversing position by extending the hydraulic cylinder even more than is shown in FIG. 6; and

FIG. 7A is a top view of the present invention as shown in FIG. 7 and showing that the reverser is still disengaged from the primary power and also shows how it has been reversed by having a pin rotate a reverser gear, which thereby reverses the rotation of the rotor.

## **DETAILED DESCRIPTION OF THE INVENTION**

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, FIG. 1 shows a baler (10) having a reverser (11) attached thereto. Referring now to FIG. 2, it is noted that a

pickup reel (12) normally turns in a counter-clockwise direction as viewed in FIG. 2 to pull the windrow (13) of crop toward a rotor (14). This rotor (14) moves in a clockwise direction in FIG. 2 to pull the crop into a throat portion (16) and ultimately into a baling chamber (17) to form a bale (18). This rotor (14) has knives (19) which can extend into and between the fingers of the rotor (14) and, when extended, will cut the crop (13) as it is passed the blades (19) by rotor (14). These knives (19) can also be disengaged by being moved downwardly in the position shown in FIG. 2, for example as shown in U.S. Patent Application Ser. No. 09/498,527, filed February 4, 2000, now U.S. Patent No. \_\_\_\_\_, which is incorporated herein by reference.

Referring now to FIGS. 1 and 4, it is noted that a hydraulic cylinder (21) has hoses (22) and (23) associated therewith for extending or retracting the hydraulic cylinder (21).

Referring now to FIG. 5A, it is noted that a driver sprocket (24) has a chain (26) extending therearound and this chain (26) is ultimately coupled to a primary source of power which is sprocket (25) which is ultimately driven by the power-takeoff of a tractor (not shown). A reverser driven sprocket (27) is rigidly connected to a hub (28). A reverser gear (29) is also rigidly attached to the hub (28) so that in the position shown in FIG. 5A, the hub (28) rotates with the driver sprocket (24) which is rigidly attached to the shaft (31).

A projection (32) rigidly attached to the driver sprocket (24) extends into a notch (33) in hub (28) so that when the driver sprocket (24) turns, so does the hub (28) and reverser driven sprocket (27) and reverser gear (29). The hub (28) is held such that the notch (33) and projection (32) are engaged because a spring (34) is pushing the hub (28)

toward the driver sprocket (24). A sleeve (36) is rigidly attached to the shaft (31) and holds the spring (34) in place and permits the hub (28) to move from the position shown in FIG. 5A to the position shown in FIG. 6A, which will be described below.

When the baler (10) is normally being used to bale the crop, such as shown in FIG. 2, the rotor (14) is moved in the direction shown in FIG. 2 by a chain (37) which engages the reverser driven sprocket (27) and engages a reverser sprocket (38). Consequently, the rotor (14) moves in whatever direction the rotor sprocket (38) turns. A reverser drive frame (39) is preferably integral with a camming surface (41) which will be referred to as a spreader (41). The drive frame (39) and camming surface (41) can be separate, however, if desired. This spreader (41) and reverser driver frame (39) are sized to fit through the slot of a rigid post (42). So, as shown in FIG. 5A, when the cylinder (21) is retracted, the spring (34) will push the hub (28) to engage and rotate with the driver sprocket (24). When the baler stops because of a blockage, the hydraulic cylinder (21) is extended to the position shown in FIGS. 6 and 6A which is the disengaging position. When this occurs, it will be appreciated that the spreader (41) has cammed against the top rigid post (42) as shown in FIG. 6A and this moves the hub (28) and everything connected to it away from the driver sprocket (24) so that the projection (32) no longer extends into notch (33). At this time, the primary power can be used to finish wrapping and putting twine or another covering on the bale (18) as shown in FIG. 3.

At this time, the hydraulic cylinder (21) can be extended further from the position shown in FIGS. 6 and 6A to the position shown in FIGS. 7 and 7A. What this does is reverse the rotation of the rotor (14) to the counter-clockwise direction shown in

FIG. 3 to pull the blockage out of the throat of the baler. This is done by having the driver frame push a pin (43) which is biased downwardly to the position shown in FIG. 4 which will engage the teeth of reverser gear (29) and rotate the reverser gear (29) from the position shown in FIG. 6 to the position shown in FIG. 7. When this occurs, because the reverser gear (29) and the reverser driven sprocket (27) are both rigidly attached to the hub (28), turning of the reverser gear (29) will cause a like reversing of the reverser driven sprocket (27). Then, because of the chain (27), it will also reverse the rotor sprocket (38), thereby reversing the rotor (14). This procedure can be repeated one or two more times, for example by moving the hydraulic cylinder back to the position shown in FIG. 6, and then after that, back to the position shown in FIG. 7. This will make a partial turn of the rotor and will unblock the throat (16). Then the baler (10) will be in a condition to return to the normal baling operation. It is noted that in the preferred embodiment, the pickup reel (12) does not rotate when the reverser is in operation as shown in FIGS. 3, 6 and 7.

In order to resume the normal baling operation as shown in FIG. 2, of course without the blockage therein, the hydraulic cylinder (21) is shortened to the position shown in FIGS. 5 and 5A. This will again allow the primary power to reverser-driven sprocket (24) to turn the hub (28) and thereby turn the reverser-driven sprocket (27). This will turn the rotor sprocket (38) through reverser chain (37), again in the clockwise direction as shown in FIG. 2, to pull the windrow of crop (13) from the pickup reel (12) through the throat (16) and into the baling chamber (17) to form a bale (18).

In operation, when an operator becomes aware that the baler is plugged, the operator will disengage the power to the power take-off (PTO). At this time the



operator activates the tractor's hydraulic system to provide pressure to the hydraulic cylinder (21). The reverser extends, causing the reverser spreader (41) to contact the rigid post (42). This motion, in turn, causes the reverser gear (29), reverser hub (28) and reverser-driven sprocket (27) to translate outward along the jack shaft (31). This disengages the coupling with the reverser driver sprocket (24).

At this time the rotor drive is disengaged from primary power. The operator can then turn on the PTO and continue to prepare the bale for ejection by wrapping it with twine or net wrap. The re-engagement of the PTO at this time can also aid in the removal of blockage by pulling material from the backside of the rotor (14) and onto the bale. After this has been completed, the operator will disengage the PTO. The complete extension of the hydraulic cylinder will cause the reverser drive bolt (43) to contact the reverser gear (29) and force it to rotate counter-clockwise. This motion also requires the reverser chain (37) and rotor sprocket (38) to rotate counter-clockwise, enabling the rotor (14) to turn backwards, which will drag the blockage to the front of the machine in small increments. It is believed that three or four extension and retraction cycles are typically necessary to remove the blockage completely.

The operator will now completely retract the reverser cylinder so that it pulls itself onto the carrier rod (44) by its carrier hooks (46). The spring (34) then pushes the reverser gear (29), hub (28) and driven sprocket (27) back into the normal baling position. The operator is now able to engage the PTO. The blockage will now be pulled into the baler and the operator can continue baling.

Accordingly, it will be appreciated that the preferred embodiment does indeed accomplish the aforementioned objects. A reverser for the rotor (14) could utilize a

reversible gear box, a DC starter or a hydraulic motor. Therefore means-plus-function clauses are intended to cover the structures described herein as performing the recited function, i.e. not only structural equivalents, but also equivalent structures. Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.